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LANDSAT PROGRESS REPORT

FOR THE PERIOD 12 AUGUST TO 11 NOVEMBER, 1975

PLANNING APPLICATIONS IN EAST CENTRAL FLORIDA

CONTRACT NO. NAS5-20907

BREVARD COUNTY PLANNING DEPARTMENT

REPORT NO. BCPD L2-3

(E76-10121) PLANNING APPLICATIONS IN EAST  
CENTRAL FLORIDA Progress Report, 12 Aug. -  
11 Nov. 1975 (NASA) 20 p HC \$3.50 CSCI 08E

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LANDSAT PROGRESS REPORT  
FOR THE PERIOD 12 AUGUST TO 11 NOVEMBER, 1975  
PLANNING APPLICATIONS IN EAST CENTRAL FLORIDA  
CONTRACT NO. NAS5-20907

Principal Investigator: John W. Hannah\*

Co-Investigators: Dr. Garland L. Thomas\*  
Fernando Esparza\*\*

Computer Programming: James J. Millard\*\*

REPORT NO. BCPD L2-3

\* Brevard County Planning Department  
\*\* NASA, Kennedy Space Center

## A. PROBLEMS

No unanticipated problems are impeding the progress of the investigation.

## B. ACCOMPLISHMENTS

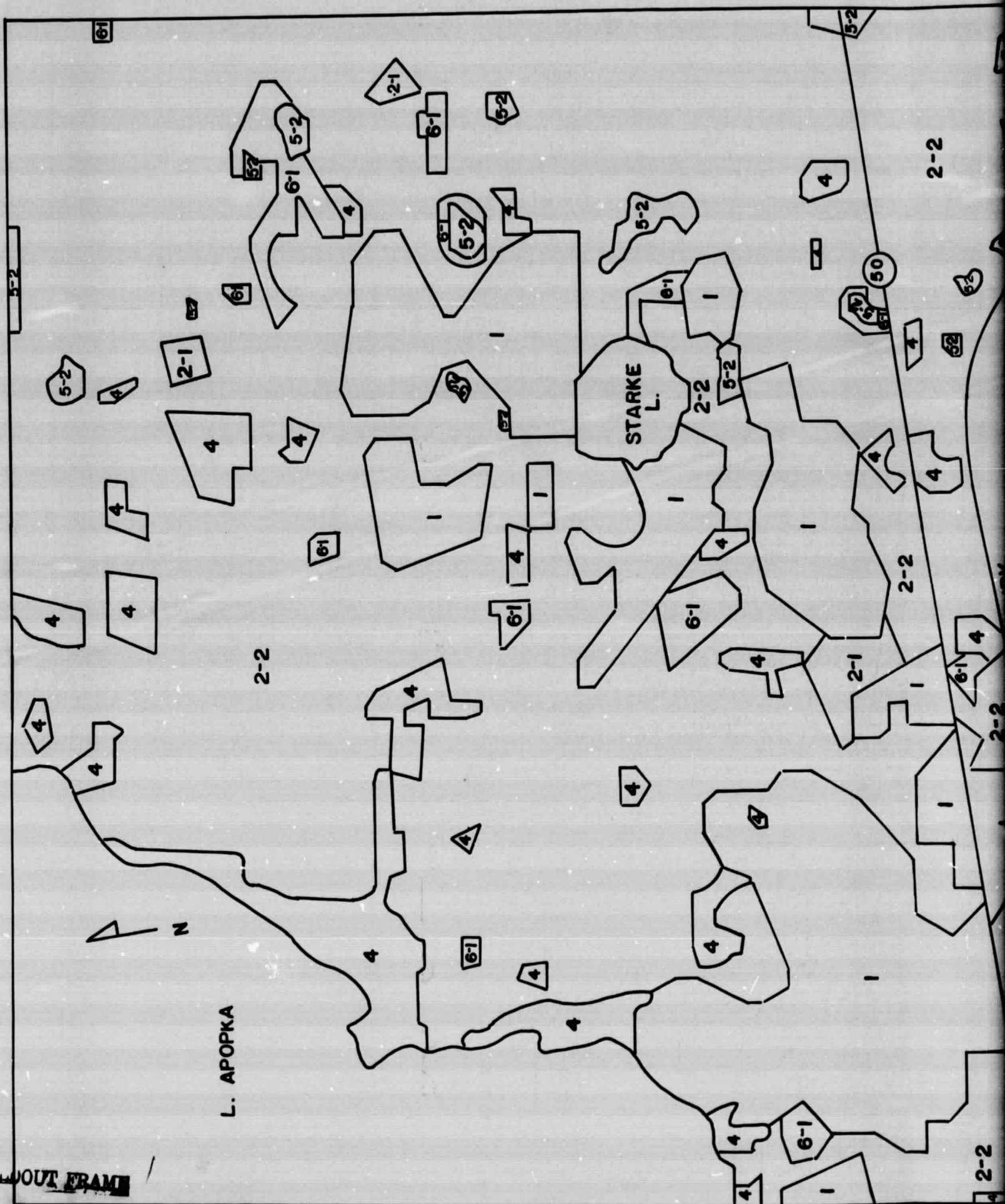
### Computer Programming

The capability of printing out histogram plots of training sample data has been added to the Matrix Tape File Generation Program. This is done prior to determination of the covariance matrix element values and related quantities. For each class, a plot is made of number of occurrences versus count (radiance or light transmitted). A plot is made for each band. The routine is applicable to Landsat, EREP S192, and microdensitometer data. The primary use of the histograms is in determination of the classes to be mapped by the Classification Program. This determination is made by comparing the histograms by overlaying them, in pairs, to evaluate their separability.

### Orange County

The Orange County Planning Department is in need of an improved land inventory within the next few months. They have recently begun a conventional parcel-by-parcel survey, but this will not be completed in time to meet their needs; hence, the feasibility of obtaining some of this information by mapping satellite data is under investigation. Two methods are being tried: (a) computer classification and mapping of Landsat data and (b) mapping from Skylab S190A photography at 1/59,000 scale (48X overall). Figure 1 shows the first sector of Orange County mapped, a sector west of Orlando. The





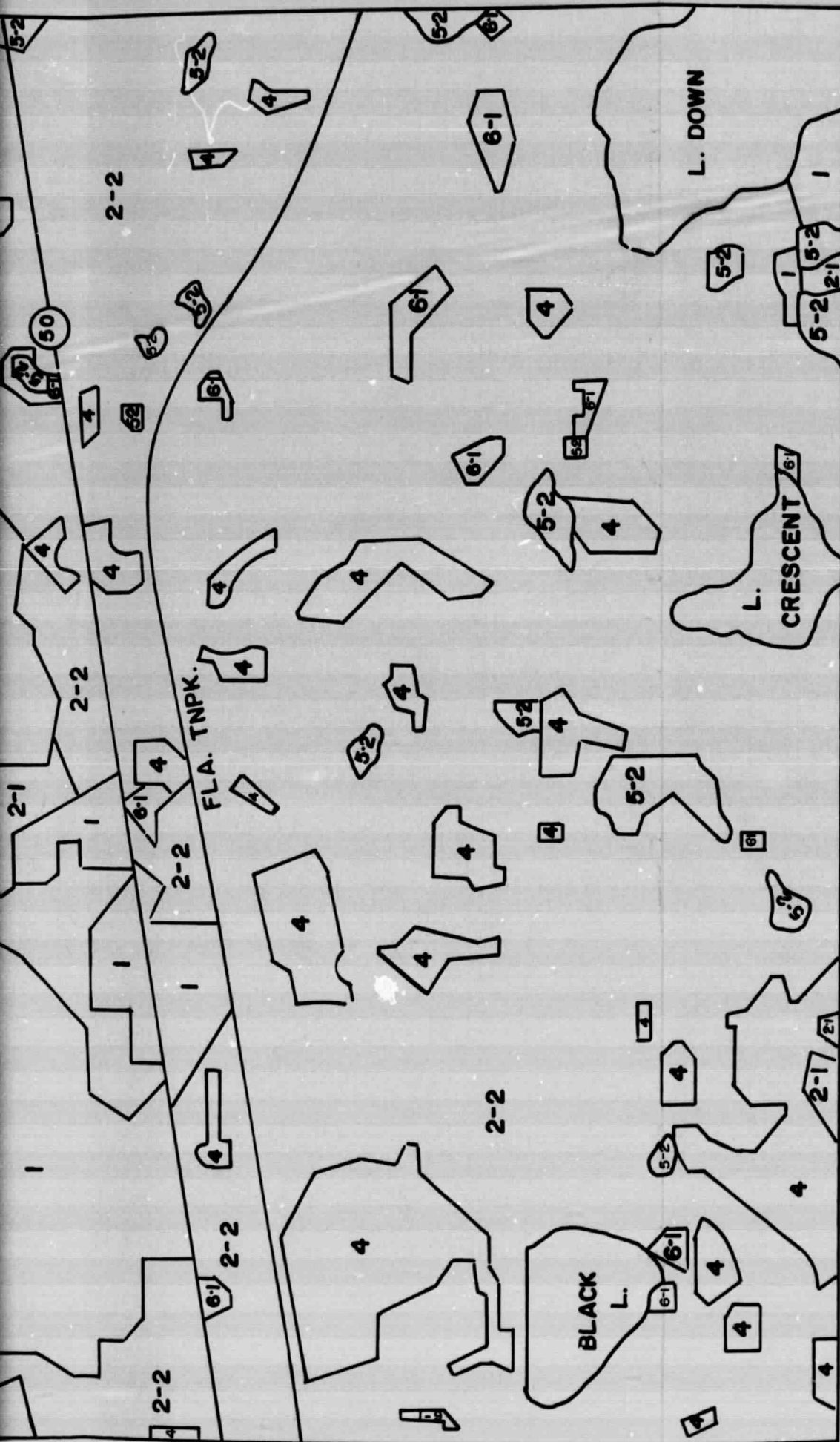


Figure 1

LANDSAT MAP, WEST ORANGE COUNTY

Scale ~ 1/36,000

FOLDOUT FRAME

2

number designations are those of the Anderson-Hardy-Roach system (listed as an appendix). This map was made by tracing the patterns from the computer-printer map. Due to the difficulty of distinguishing some citrus sectors from urban features when performing computer classification, we have used a two-stage mapping process. The first stage, exemplified by Figure 1, is used for non-urban mapping, with all urban features included in a single class. The spectral characteristics of citrus groves vary widely, depending upon the relative amounts of sand and foliage seen from above. Hence, the spectral appearance of citrus can vary from close similarity to highly reflecting urban regions to close similarity to forest. We have approached the problem by designating two classes of citrus (both identified by the same printer character): (1) "young" citrus with relatively large amounts of sand visible and (2) "old" citrus, with relatively little sand visible. Some "urban" patches still appear among the citrus; in order to get a useful map, these must be disregarded on the basis of local knowledge or comparison with aircraft photography. In preparing the map of Figure 1, such anomalous "urban" patches have been disregarded.

Figure 2 is the S190A map of the same sector. Each method has some relative advantages: The photography shows more roads and shows urban features more distinctly. The Landsat map is more reliable for wetlands delineation. Most of the differences between the two are in the pattern of forest patches seen among the citrus groves. Generally, for those determinations, the photography was found to be more correct, as it utilizes





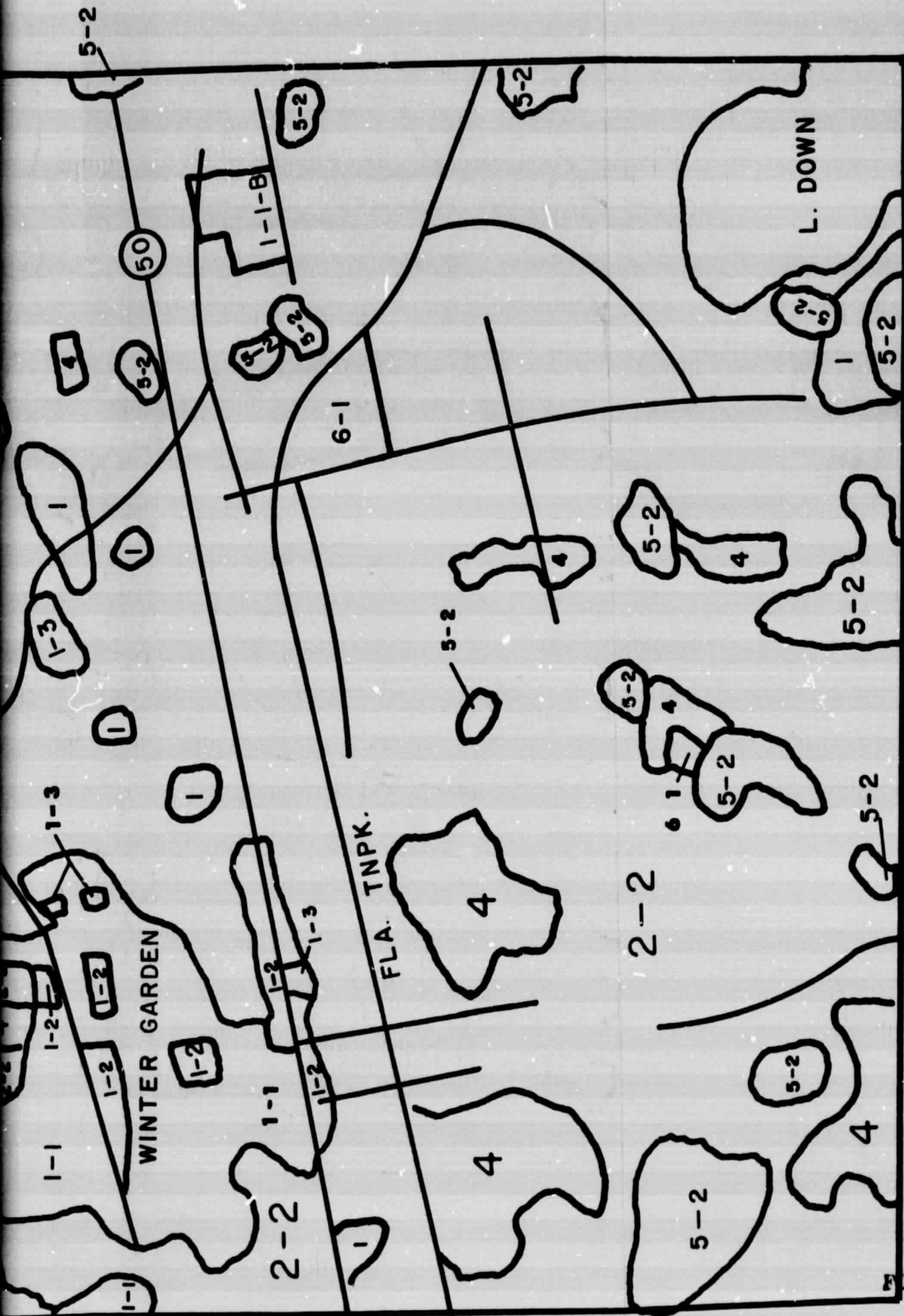


Figure 2

SKYLAB S190A MAP, WEST ORANGE COUNTY

Scale ~ 1/36,000

FOLDOUT FRAME N

the advantage of looking at the whole shape of a forest patch, contrasted to the point-by-point computer classification. The results of the photographic interpretation are likely to depend somewhat upon the interpreter; but, with this interpreter, the EREP map generally showed larger patches of forest than did the computer map. In some cases, however, the less connected patches of the computer map were found to be more correct.

Differences between Figures 1 and 2 were resolved by checking with aircraft photography.

For a one-time mapping, the map based on Skylab photography probably is more useful than the Landsat map; but, taking into account the repetitive nature of Landsat with associated change-monitoring capability and the possibility of easy quantitative determinations with digital data, the tentative plan, subject to further evaluation, is to make a base map from current Landsat data corrected as necessary from Skylab and aircraft photography. We believe this provides a map which is as accurate as presently possible from satellite data and which is suitable for updating and change-monitoring.

Figure 3 shows the corrections which were made to Figure 1. Corrections based on Skylab photography amount to 1% of the area, and corrections based on aircraft photography also amount to 1% of the area. The number outside the parenthesis indicates the land use designation as corrected, and, the number inside the parenthesis indicates the Landsat designation.



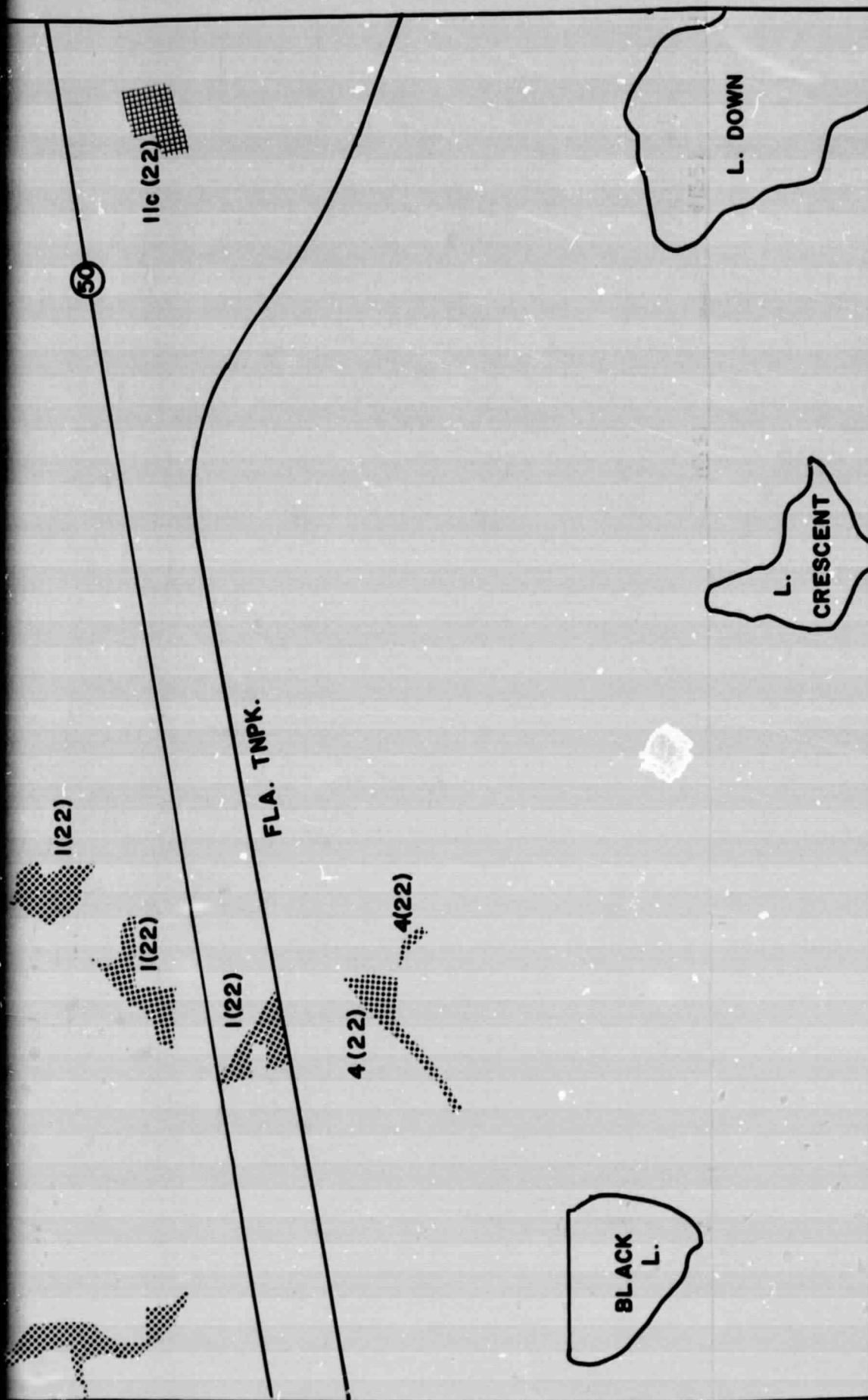


Figure 3

CORRECTIONS TO LANDSAT MAP

Based on Skylab Photography

Based on Aircraft Photography

Scale ~ 1/36,000





In every case, that pre-correction designation was citrus. That is partially because the map used was one which favored citrus over "new" groves similar spectrally to urban sectors, as discussed above. A straight MAXLIK classification shows more citrus (and less urban) than does a MAXMIN classification because the MAXLIK method is more sensitive to a priori probabilities, favoring those classes having higher a priori probabilities where the difference is large, as in this case.<sup>1</sup>

Our experience is that the above procedure provides a satisfactory map for the non-urban portion if we do not worry about internal urban separations. Then the second stage in the process is preparation of a classification map which separates urban classes but is not used for non-urban sectors. The urban sectors in this portion of the county are Winter Garden (population about 5,000), Ocoee (4,000), and part of Oakland (700). The Winter Garden planner helped select training samples for this classification. The simplified version of this urban map, with some corrections from aircraft photography, is shown as Figure 4. The Classification program did not distinguish satisfactorily between commercial and industrial; that distinction was provided by the Winter Garden planner.

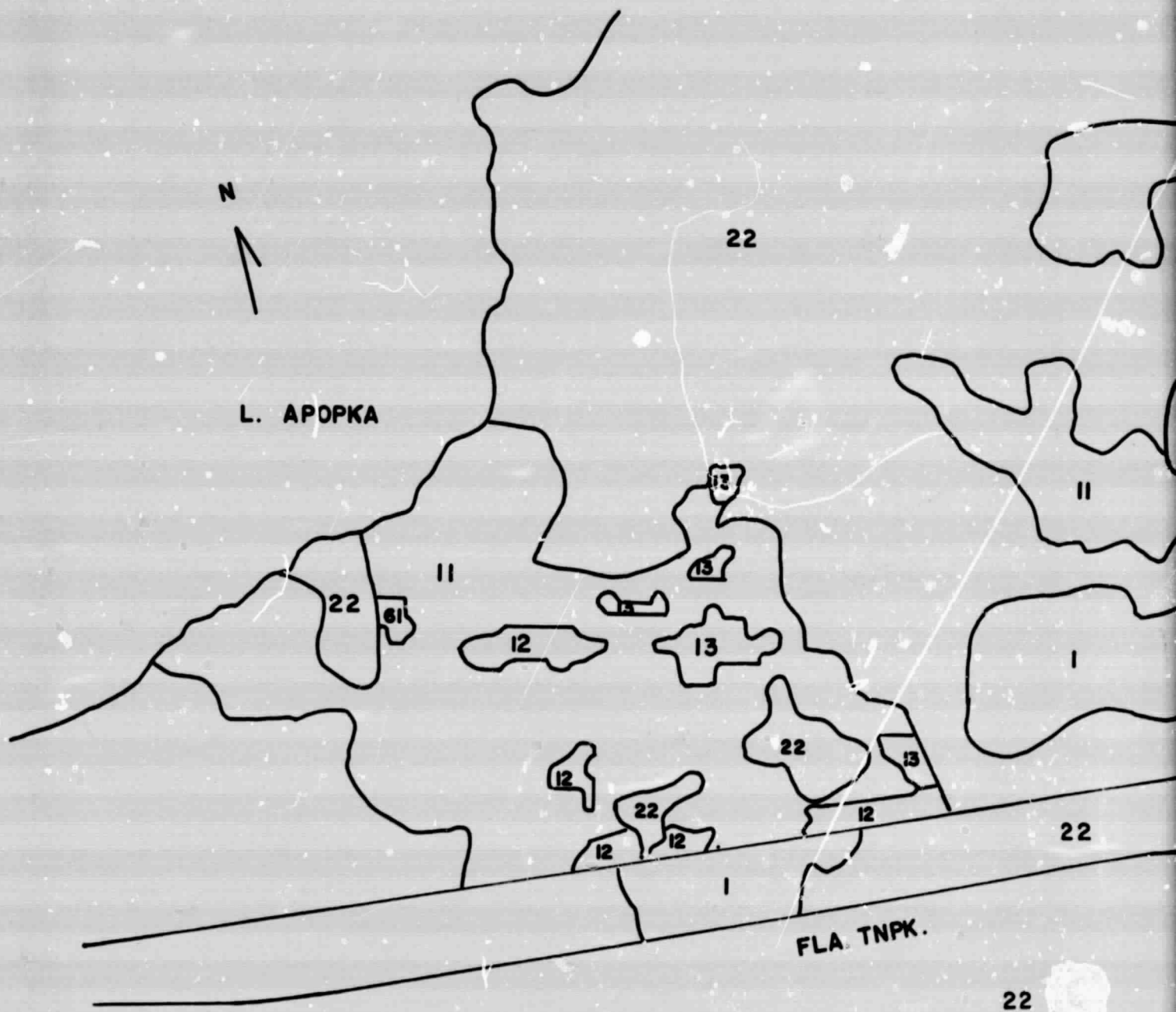
The final map is shown as Figure 5.

#### Workshop

On September 5, Brevard County and Kennedy Space Center jointly sponsored a workshop for planners of this region. Forty representatives

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<sup>1</sup> cf. ERTS-1 FINAL REPORT, NASA-TM-X-69013. December 15, 1975  
p. 5.



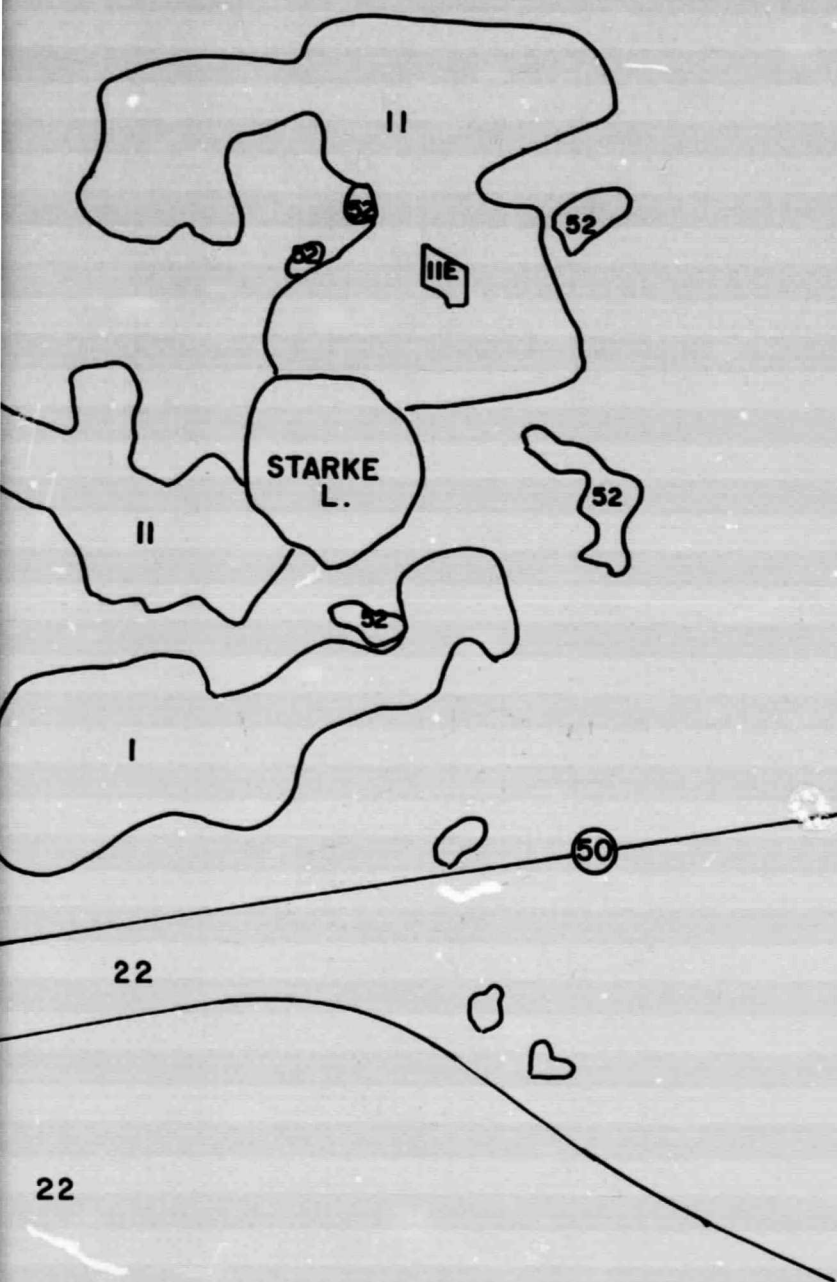
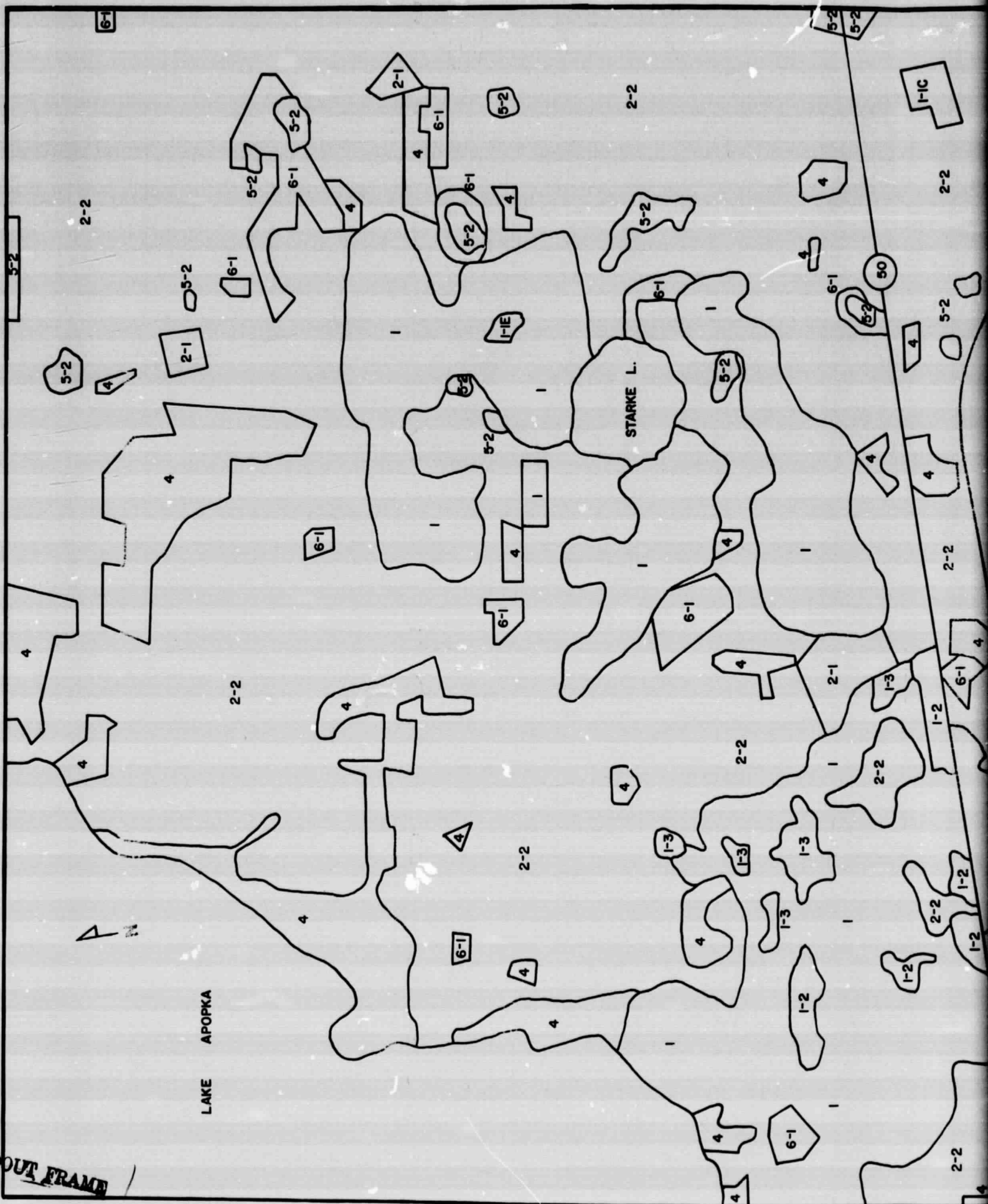


Figure 4  
URBAN MAP, WEST ORANGE COUNTY  
Scale ~ 1/36,000

FOLDOUT FRAME 5

FOLDOUT FRAME





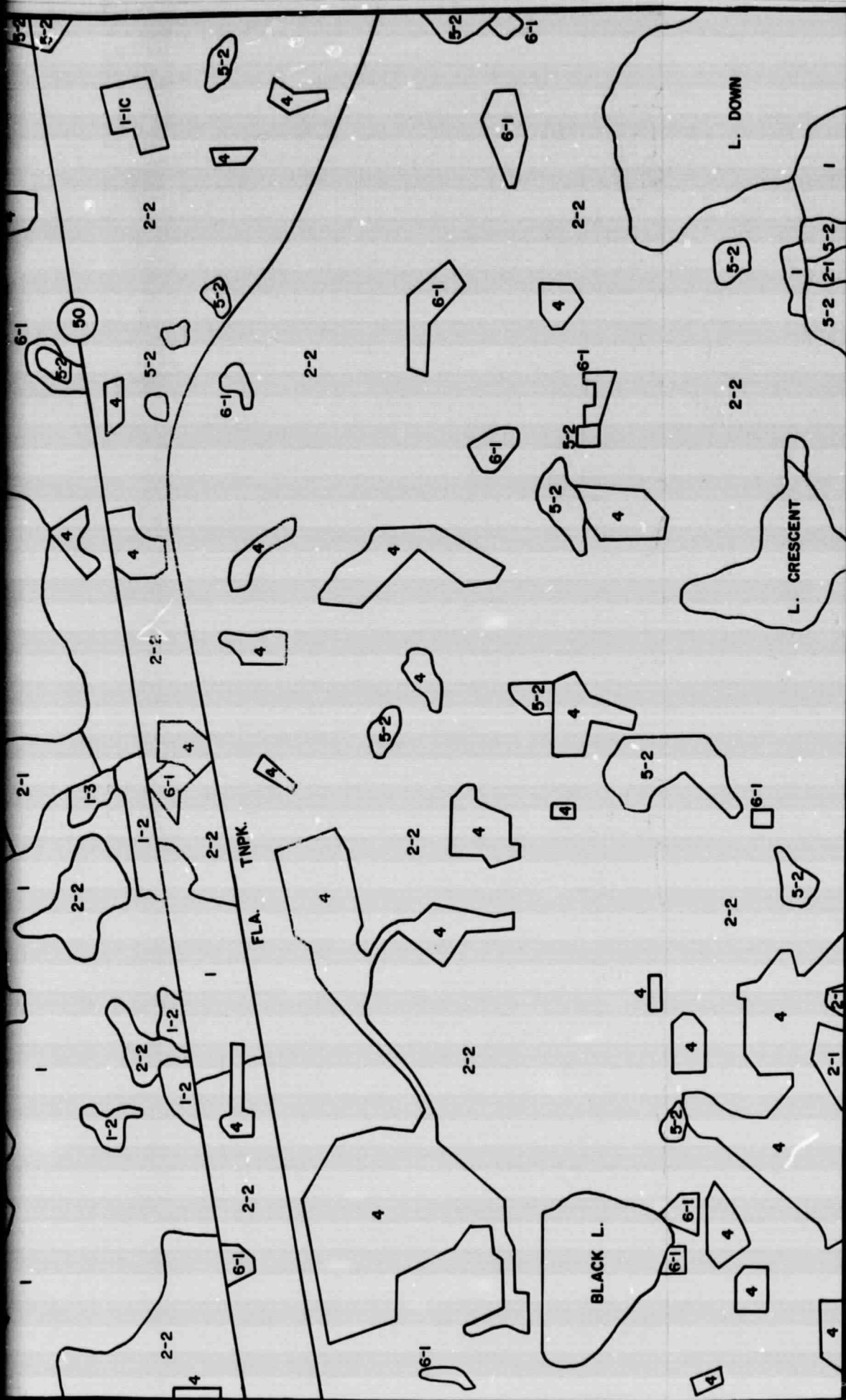


Figure 5  
CORRECTED MAP, WEST ORANGE COUNTY  
Scale ~ 1/36,000

of various planning agencies attended the meeting, held at Kennedy Space Center. The program is given as an appendix.

C. SIGNIFICANT RESULTS

None

D. PUBLICATIONS

None

E. RECOMMENDATIONS

None

F. FUNDS EXPENDED

Expenditures this quarter: \$4438.30

G. DATA USE

<u>VALUE OF DATA ALLOWED</u>	<u>VALUE OF DATA ORDERED</u>	<u>VALUE OF DATA RECEIVED</u>
\$1,200	\$504	\$304

Eight sets of images were received during the quarter. A set of digital tapes was ordered and reported as not reproducible; a second set has been ordered but not yet received.

## ACKNOWLEDGMENTS

Planners who have contributed to the work described herein include James Sellen, Scott Henderson, and Greg Adkins of Orange County and Edward Washburn, Winter Garden planner.

U. Reed Barnett and Edward J. Hecker, of NASA, participated in arranging the workshop.

## APPENDIX A

### LAND-USE CATEGORIES:

#### Level 1

01. Urban and built-up land

02. Agricultural land

03. Rangeland

04. Forest land

05. Water

06. Nonforested Wetland

07. Barren Land

#### Mixed Categories

Open and Citrus Groves

Groves and Lakes

Lakes, Groves & Vegetated Wetlands

#### Level 2

- 01. Residential
  - a. Wooded Residential
  - b. Non-wooded Residential
  - c. Rural residential
  - d. Mobile-home parks
  - e. bare sand (non-landscaped)
- 02. Commercial and services
- 03. Industrial
- 04. Extraction
  - a. Phosphate mines
  - b. Reclaimed phosphate mines-
- 05. Transportation
- 07. Strip
- 09. Open
- 10. Institutional & recreational
- 11. New construction

- 01. Cropland and pasture
  - a. Muck farms (vegetables)
  - b. Vegetable farming
  - c. Pasture
- 02. Groves
  - a. Primarily citrus

01. Grass

- 01. Deciduous
- 02. Evergreen (pine)
- 03. Mixed

- 01. Streams and waterways
- 02. Lakes
- 03. Other (Gulf of Mexico)

- 01. Vegetated
- 02. Bare

03. Sand other than beaches

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## APPENDIX B

### WORKSHOP ON PLANNING APPLICATIONS OF SATELLITE DATA

September 5, 1975

#### WELCOME

J. P. Claybourne, Chief, Earth Resources Branch,  
Kennedy Space Center

#### INTRODUCTION TO THE MEETING

John W. Hannah, Development Coordinator, Brevard  
County Board of County Commissioners

#### OVERVIEW OF THE SATELLITE EARTH RESOURCES PROGRAM

Edward J. Hecker, Earth Resources Branch,  
Kennedy Space Center

#### PRESENT WORK IN EAST CENTRAL FLORIDA

G. L. Thomas, Co-investigator, Landsat and EREP  
Projects, Brevard County Planning and Zoning Department

#### LUNCH BREAK

#### LOCAL EXPERIENCE

Orange County  
Scott Henderson, Parks Planner

Alachua County

#### DISCUSSION AND QUESTION AND ANSWER SESSION

#### TOUR OF KSC EARTH RESOURCES DATA ANALYSIS FACILITY